CHESAPEAKE & OHIO CANAL,
CONOCOCHEAGUE CREEK AQUEDUCT
(Chesapeake & Ohio Canal,
Aqueduct No. 5)
Milepost 99.80
Chesapeake & Ohio Canal National Park
Williamsport [redacted]
Washington County
Maryland

HAER No. MD-123

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
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HISTORIC AMERICAN ENGINEERING RECORD

CHESAPEAKE & OHIO CANAL, CONOCOCHEAGUE CREEK AQUEDUCT
(Chesapeake & Ohio Canal, Aqueduct No. 5)

HAER NO. MD-123

Location:	Milepost 99.80, in Chesapeake and Ohio Canal National Park, Williamsport, Washington County, Maryland.
Date of Construction:	1833-34
Builder:	Michael Byrne and Company Frederick, Maryland
Present Owner:	Chesapeake and Ohio Canal National Historical Park
Present Use:	Bike and foot path
Significance:	The Conococheague Creek Aqueduct was the fifth of eleven masonry aqueduct constructed along the Chesapeake and Ohio Canal. It was the last and most ornate of the system's five multiple span aqueducts.
Historian:	Lee R. Maddex Institute for the History of Technology and Industrial Archaeology West Virginia University Morgantown, West Virginia 26506
Project Information:	This recording project is part of the Historic American Engineering Record(HAER), a long-range program to document historically significant engineering and industrial works in the United States. The HAER program is administered by the Historic American Buildings Survey/Historic American Engineering Record division(HABS/HAER) of the National Park Service, US Department of the Interior. The Conococheague Creek Aqueduct

Recording project was cosponsored during the summer of 1996 by HABS/HAER under the general direction of Blaine Cliver, Chief, and by the Institute for the History of Technology and Industrial Archaeology (IHTIA), Emory L. Kemp, Director.

The field work, measured drawings, historical reports, and photographs were prepared under the direction of Eric N. DeLony, Chief of HAER and Project Leader Dean A. Herrin, HAER Historian. The recording team consisted of HAER Architect Dana Lockett, IHTIA Historian Lee R. Maddex, and IHTIA Photographer John Nicely.

> The AQUEDUCT, across the Conococheague...combines strength and massive solidity with a very high degree of beauty and grace. Seated as it is in the bosom of delightful scenery, with a long and majestic curve of artificial canal extending from either abutment, and around the great bend of the Potomac, it forms to the eye an extremely agreeable and impressive spectacle, the praise and admiration of every beholder.
> (Williamsport Republican Banner, 26 September 1834)

Introduction

The Conococheague Creek Aqueduct, located at Williamsport, Maryland, carries the water of the Chesapeake and Ohio Canal across the Conococheague. Completed in 1834, the three arch masonry structure exemplifies the high state of civil engineering attained during the American canal building era. The Chesapeake and Ohio Canal Company referred to its aqueducts (and other masonry structures) as "works of art." The canal and its many engineered structures have been the subject of numerous studies, particularly since the waterway became a unit of the National Park Service, but little has been written specifically on the Conococheague Creek Aqueduct. The following study focuses on the construction and history of the Conococheague Creek Aqueduct or Aqueduct No. 5 as it was known during the canal's operating period.

History and Construction of the C&O Canal

Early History

The Potomac River Valley, when compared to other trans-appalachian corridors, offered the shortest route to the Forks of the Ohio at Pittsburgh, Pennsylvania. From Washington, DC to

Pittsburgh, following Wills Creek, the route measured 341 miles. When compared to the Philadelphia to Pittsburgh route of 394 miles or the 362 miles between Lake Erie and the Hudson River it was the shortest path to the Ohio. Beginning in the mid-eighteenth century, five significant attempts were made to improve and develop a system of transportation in the Potomac Valley.[1]

The Ohio Company, established in 1749 by prominent Virginia planters, was the first to establish an overland route to the Ohio River. Using an existing trail system to the Forks of the Ohio, the Ohio Company carried on an extensive fur trade with Native Americans living on the waters of the Monongahela, Youghiogheny and Ohio Rivers.[2] During the French and Indian War, British General Edward Braddock's army widened and improved the trail system into a crude road. In time, Braddock's Road became the foundation for parts of the National Road, the second overland, non-water route. The National Road, begun in 1811, reached the Ohio River at Wheeling, [West] Virginia in 1818. The Baltimore and Ohio (B&O) Railroad became the third overland transportation system to use the Potomac corridor. Chartered in 1827 and completed in 1852, the B&O stretched from Baltimore to the Ohio at Wheeling.[3] The other two major efforts to improve transportation in the Potomac River Valley were the Potowmack Company and the later Chesapeake and Ohio (C&O) Canal Company.

The Potowmack Company

The Potowmack Company was the first company to undertake the navigational improvement of the Potomac River. Envisioned by George Washington, the Potowmack Company was chartered by both the Virginia and Maryland assemblies in 1784. The terms of its charter stated that the company was, within five years time, to improve the Potomac River from tidewater to the highest point practical on the North Branch.[4]

In May 1785, Washington was elected the Potowmack Company's first president. Under his direction, the Potowmack Company began navigational improvements to the Potomac River. Most of these improvements involved clearing obstructions from the river

bed, deepening the river channel, and constructing skirting or bypass canals and locks. When finished these improvements were to allow the passage of boats carrying fifty barrels of flour in the driest season.[5]

The Potowmack Company immediately began constructing skirting canals around the falls and rapids of the Potomac River. In 1792, after seven years of work, the company completed canals around the Potomac's uppermost rapids at House Falls, Shenandoah (or Paynes) Falls, and Seneca Falls. The most difficult construction still remained at Little Falls and Great Falls, where locks were required. Unfortunately, after tremendous labors, the canal engineers discovered that a deep cut through solid bed rock was needed at Great Falls. Finally in 1802, the company completed its work on the Great Falls Canal and the Potowmack Company claimed the Potomac was navigatible for 220 miles from tidewater to the mouth of the Savage River. The Potowmack Company then turned its attention to the improvement of the Potomac's larger tributaries: Conococheague Creek, Antietam Creek, the Monocacy River, and the Shenandoah River. Yet, after 1816, under the stress of financial problems, labor shortages, and the difficulty of excavation, work by the Potowmack Company virtually ceased.[6]

TABLE NO. 1-POTOWMACK COMPANY IMPROVEMENTS

Obstruction	Change Elev	Type Canal	Total Length	# Locks
Little Falls	37.5 ft	Skirting	3,814 yds	3/4*
Great Falls	76.9 ft	Skirting	1,820 yds	5
Seneca Falls	7.0 ft	Cut	1,430 yds	0
Shenandoah Falls	15.0 ft	Cut	1,760 yds	0
House Falls	3.0 ft	Cut	50 yds	0

*Originally the Little Falls Skirting Canal had 3 or 4 wooden locks, which the Potowmac Company replaced in 1815 with 3 stone

locks. Compiled from George Washington's Canal at Great Falls, Virginia.

The Potowmack Company's improvements, while favorably received, were seasonal at best. Most boats could not pass in the dry season, but the system was still popular and the locks around Little and Great Falls were quite busy. Despite the shortcomings of the system, cargo--primarily agricultural produce, flour, potash, coal, whiskey, iron, and other products--made its way down the Potomac to Georgetown via the canals. Manufactured goods were transported up river as well, although that trip was much more difficult and time consuming.[7]

In 1820 and 1822, Thomas Moore, Virginia's state engineer, examined and determined it was possible to build a canal connecting the southern branches of the Ohio with the Potomac River. His report fired interest in a new cut canal and these flames were fanned when a joint Maryland and Virginia commission examined the possibility of such a canal. In their "Report on the Potomac River and Branches," released in January 1823, the commissioners proposed the abandonment of the Potomack Company's improvements and withdrawing its charter. They further recommended replacing the old works with a new cut canal paralleling the Potomac River.[8] The commission's report led to the Chesapeake and Ohio Canal Convention, held at Washington, DC in November 1823.

The Chesapeake and Ohio Canal Company

The November 1823 Chesapeake and Ohio Canal Convention had a broad base of representation. Albert Gallatin, Francis Scott Key, John Mason, Richard Byrd and many others in attendance recognized that the Potowmack Company and its improvement had out-lived its usefulness, as the larger vessels now descending the river could not pass through the skirting canals and locks. The convention resolved that a canal system be planned, and called for federal support in its construction.[9] Fortunately, the era of canal mania had dawned in America inspired by the success of the Erie Canal.

When construction on the 320 mile long Erie Canal began in 1817, the eastern port cities of Philadelphia, Baltimore, and Richmond quickly realized that the Erie Canal would siphon off trade from their cities and New York City would become the center for eastern trade. In response, Pennsylvania, Virginia, and Maryland all initiated canal construction projects trying to capture Western trade.

Pennsylvania began construction of the Pennsylvania Mainline Canal in 1824. When completed in 1835, the canal used a mixed system of railroads, cut canals, and inclined planes stretching 395 miles from Philadelphia to Pittsburgh, a distance of 330 miles. The system cost $12.6 million, but was abandoned in the 1850s in favor of the Pennsylvania Railroad.[10]

In Virginia, work resumed on a James River Canal, another George Washington project. Chartered in 1785, the James River Company began constructing a canal to connect tidewater Richmond with the Ohio. This work stopped after 1795, but was revived in 1816 when the state bought the original charter. The Virginia Board of Public Works and the later private James River and Kanawha Canal Company struggled for forty years to complete the canal. By 1856, only 246 miles were completed and efforts to finish the canal were abandoned at Buchanan, Virginia, far short of the Ohio River.[11]

In Maryland, the interest generated by the Chesapeake and Ohio Canal Convention excited the citizens of the Potomac Valley. They embraced the proposal, believing the canal would bring prosperity to the region. Marylanders outside the valley also embraced the canal, but Baltimoreans in particular, while recognizing that the canal would benefit the state, felt that its construction would do more harm than good for the city of Baltimore. Baltimore was traditionally a wheat port and wheat grown in the Potomac Valley was shipped to Baltimore for milling and shipment elsewhere. The Baltimoreans felt if the canal terminated at Georgetown or Alexandria, then a large portion of their wheat trade would be drawn away from their port. After much debate and many surveys, plans for a branch canal connecting the proposed C&O Canal with Baltimore were abandoned and plans

for a railroad developed. The railroad, while unproven in America, offered the only reasonable alternative for maintaining the city's trade dominance.[12]

Although interest in the Potomac Valley for the canal continued to grow, lingering doubts remained about the practicality of its construction, particularly the availability of a summit level water supply. President James Monroe favored the resolutions of the November 1823 canal convention and, in December 1823, asked Congress to approve and fund the use of Army engineers to determine the practicability of the canal. In February 1825, the U.S. Board of Engineers submitted a preliminary report showing the canal was entirely practical and that summit level water was available. Finally in October 1826, the Board of Engineers submitted its final report to Congress. In the report, the Army engineers, recommended that the size of the canal be increased from three feet deep by thirty feet wide to five feet deep by forty-eight feet wide to accommodate larger vessels. The Army engineers estimated a canal from tidewater to the Forks of the Ohio would cost an incredible $22 million, far greater than anyone's expectations or treasury. The canal promoters called for the estimates to be re-examined and President John Quincy Adams appointed James Geddes and Nathan S. Roberts, two notable Erie Canal engineers, to re-estimate the canal's cost. They arrived at a price of $6 million, a cost which, while much more acceptable to the canal supporters, was, in fact, grossly in error.[13]

In the meantime, the C&O Canal promoters slowly overcame the sectionalism that plagued Virginia, Maryland, and Pennsylvania toward chartering the improvement project. In January 1824, Virginia became the first state to charter the C&O Canal Company. A year later, Maryland confirmed the Virginia act. Congress, after a lengthy debate and with assurances from the Board of Engineers, affirmed Virginia's charter in March 1825. Pennsylvania finally ratified the act in February 1826.[14]

Once the charters were in place, the C&O Canal Company opened its books for subscriptions. Maryland subscribed to $500,000; $1,500,000 came from the district cities of Georgetown,

Alexandria, and Washington, and from surrounding communities; and the federal government pledged $1,000,000 to bring in Maryland. Although both Virginia and Pennsylvania chartered the canal company, neither subscribed to or funded the project.[15]

The C&O Canal Company with $3 million in subscriptions was formally organized in June 1828, when the stockholders met and elected General Charles F. Mercer president. On July 4, 1828, the C&O Canal Company officially commenced construction with a ground breaking ceremony held at Little Falls, five miles above Georgetown. President John Quincy Adams was invited to turn the first shovel of earth, but on his first attempt the shovel hit a root. Perhaps an omen of future troubles, it took the president three tries to turn the first spade of earth. Ironically, the B&O Railroad broke ground the same day near Baltimore, with Charles Carroll turning the first spade of earth.[16]

C&O Canal Construction

The C&O Canal, as originally envisioned, was to be built in three legs: eastern, middle, and western, with construction begun on the east leg first and progressing westward. The east leg was further subdivided into three divisions consisting of 120 sections. Each section was approximately one-half mile in length and twenty sections then formed a residency. There were six residencies to each division. A Resident Engineer was placed in charge of each residency, with the six engineers subservient to the Division Engineer. The three Division Engineers formed the Board of Engineers. The engineer in charge of the first division automatically served as Chief Engineer.[17]

The canal company hired many engineers formerly employed on other canals, particularly the Erie Canal, to design and oversee construction of the canal. James Geddes and Nathan S. Roberts, who re-estimated the canal costs, both had played important roles in the Erie project; and Roberts, along with Benjamin Wright and John Martineau, served as members of the C&O Canal's first Board of Engineers. Wright, the first chief engineer, played a significant role in the Erie Canal's construction and in other American canals as well. The roster of other early C&O engineers

included Charles Ellet, Jr.; Thomas F. Purcell; Alfred Cruger; and Charles Fisk. At times of financial crises, the canal company found the engineering staff expendable and frequently laid off the engineering staff, forcing the company to hire new staff when construction resumed. This was a common practice in the canal building era, and facilitated the movement of engineers from one canal project to another.[18] The movement from project to project was also true for contractors and many moved from the Erie Canal and other canals to the C&O project.

To expedite the canal's construction, the Board of Engineers issued circulars and letters to the contractors detailing specifications for locks, culverts, the canal prism, and aqueducts. Contractors bid on constructing sections or specific structures such as locks and aqueducts. The President and Directors awarded contracts based on the estimates submitted by the Resident Engineers. Further, any change orders or cost over runs had to be approved by the President and Directors. None of the company officers were engineers and this lack of practical engineering knowledge hampered construction on several occasions.[19] The shortcomings of this system were not the only logistical problems created with the construction.

The C&O Canal Company suffered from a chronic labor shortage. The Potomac Valley was primarily agriculturally based and there was not a surplus of labor. This forced the canal company to import labor from other regions. After trying indentured servants, they turned to Irish and German immigrants to build the canal. But with other canals competing for workers and with the reputation of the valley as sickly in the summertime, the canal company had a very difficult time attracting and retaining a steady workforce.

Land acquisition was also a problem, as recalcitrant landowners refused to sell their land to the canal company. They chose instead to hold out. This forced the canal company to initiate condemnation proceedings, where commissioners arbitrated a settlement. These settlements awarded unusually high damages to the landowners, which had the effect of taxing the company's already limited resources, as well as delaying construction.[20]

Significantly, as the canal progressed westward, construction became more difficult, as the canal engineers encountered granite bedrock, hardpan, and gravel not revealed while laying out the sections (The army engineers recognized this difficulty of construction and their higher cost estimates reflected this fact). While this mostly occurred above Harpers Ferry, difficult excavation was normal everywhere. Thus the construction became more labor intensive and used more resources than anticipated. This condition was further worsened by the increased dimension of the canal. But the most time consuming and costly affair for the canal company was its fight with the B&O Railroad over the right of prior location in the Potomac Valley.

In June 1828, the C&O Canal Company obtained an injunction against the B&O, halting their survey crews from continuing past Point of Rocks. The B&O crews had been locating their line and obtaining land easements, especially at the narrow places in the Potomac Valley, where the line would likely compete with the canal. Because the Potowmack Company surrendered its charter to the C&O Canal Company, the canal company believed it held the right of prior location up the Potomac Valley. So at Point of Rocks, at a place so narrow that it could only accommodate one line, a court battle ensued over who held the right-of-way and halting construction on the canal. In September 1831, the Chancery Court ruled in favor of the railroad, and the canal company appealed the decision. The Court of Appeals of Maryland, in January 1832, overturned the earlier ruling and upheld the canal company's right to prior location.[21] The canal company won the battle, but it lost valuable time, as the company had to complete 100 miles of the canal before 1834, or possibly lose its charter. Although work below Point of Rocks continued during the period of litigation, construction ceased at Point of Rocks and now the race was on to complete the first 100 miles.

The cost of litigating the Points of Rock court case nearly depleted the canal company's financial resources. Despite the shortage of money, the President and Directors awarded contracts in March and June 1832 to complete enough of the canal above Harpers Ferry to meet the terms of the charter. Although not

permitted by its charter, the company decided to use slackwater navigations to make the required 100 miles above tidewater.[22] To help stem their financial difficulties, canal officials resorted to cheapening the canal through a number of measures. Because there was a lack of good building stone above Williamsport, the company chose to use composite wood and stone locks and to construct frame lockhouses.[23] The President and Directors also chose to employ slackwater navigations for short distances above both Dam Nos. 4 and 5, because of the extreme cost of excavating in those areas.[24]

Construction along the line progressed after the 1832 settlement and by 1839, some 134 miles of canal had been constructed, with navigation completed between Georgetown and Dam No. 6. All work on the C&O Canal ceased in 1842, when the company went bankrupt. Construction remained idle until 1846, when loans were secured and construction continued on what was called the "fifty mile section." The greatest challenge faced by the canal company in this period was the completion of the Paw Paw Tunnel. By boring the tunnel, the company saved five miles of sinuous canal construction, but the tunnel proved problematic. Begun in 1835, the tunnel was not finished until 1850. The company, also finished construction on Aqueduct Nos. 6 through 11 in this period.

The Chesapeake and Ohio Canal, with much fanfare, was officially opened for navigation on October 10, 1850 after twenty-two years of construction. The completed canal system followed the northern shore of the Potomac River for 184.5 miles from Georgetown to Cumberland, Maryland, overcoming 605 feet in elevation, but still far from its intended western terminus at Pittsburgh, Pennsylvania. The canal was virtually obsolete before it opened to traffic as the B&O Railroad had reached Cumberland eight years earlier and would reach the Ohio at Wheeling, [West] Virginia in December 1852.

The C&O Canal 1850-1924

The C&O Canal Company had difficulty turning a profit in the years from 1850 to 1860. Unable to retire its debts, the company

nearly failed and the waterway fell into a state of disrepair. The Civil War years, however, proved a blessing for the canal company. Wartime inflation enabled the canal company to raise its tolls and this led to surplus revenues. With the profits, the canal company was able to repair the devastation wrought on the canal by the war and was able for the first time to begin retiring its debts.[25]

The C&O Canal was in direct competition with the B&O, but the canal managed to create a niche in transporting agricultural products, stone, lime, and coal from the western Maryland mines. The 1870s were prosperous years for the C&O Canal and the waterway continued to turn a profit. Wisely, the canal company returned some of these profits into renovating the canal. From June 1870 to December 1871 the canal received a much needed restoration. But these halcyon days of profitability were short-lived as the lingering depression following the Panic of 1873 affected the mining and other industries along the canal and shipping declined. It was never to return the record tonnages delivered before the depression.[26] Natural disasters, however, were the system's bane.

After the Panic of 1873 finally receded in the late 1870s, renewed financial difficulties plagued the canal company, but sustained annual flooding was the canal's greatest enemy. Floods devastated the waterway while under construction and nearly annually during its years of operation. Because of the increased run-off caused by the deforestation of the Potomac Valley, annual floods became more and more destructive. Somehow after each devastating flood, the canal company managed to restore navigation. The Flood of 1889, however, ruined the canal and the canal company could not pay for the repairs necessary to restore it to an operating condition. When the canal went into receivership in 1889, the B&O Railroad, who held the mortgage, feared that its competition, the Western Maryland Railroad, would gain control of the canal if the property were sold. One termini of the Western Maryland was at Williamsport, and if it had purchased the canal, it would have likely filled in the canal to construct a line from Williamsport to Cumberland. To prevent this from happening, the B&O restored the canal to operating

condition and established the Chesapeake and Ohio Transportation Company to operate it. This company, however, was created to satisfy the terms of the receivership and was, in fact, a "shadow" company that annually showed a profit, while actually losing money.[27]

In 1902, the Consolidated Coal Company, a subsidiary of the B&O, organized the Canal Towage Company to operate the canal. This new company spelled the end of the independent boatman, bringing regulation and uniformity to the canal. Under the new administration, canal boats became company property and were painted and numbered; schedules set for delivery; and recalcitrant captains dismissed. The canal continued to operate as if successful until the closure of the 1923 season. Preparations for a new boating season were underway when the 1924 spring flood damaged the canal. The Canal Towage Company repaired the lower end (where waterpower was sold to Georgetown industries) and abandoned the remaining canal.[28]

The terms of the receivership required the C&O Canal to remain in operation or it could be sold to the highest bidder. Significantly, the B&O maintained that the canal could be placed back into operation at any time and this contention was oddly supported by the courts. This stance averted any sales of the property. This was the status quo of the C&O Canal until the Great Depression forced the B&O Railroad into receivership. The B&O received a $2 million loan from the Reconstruction Finance Corporation in 1937. Desirous of disposing of the property, the federal government in February 1938 purchased the C&O Canal for $2 million, the exact amount needed to pay back the loan. At that point the C&O Canal became a unit in the National Park system.[29]

C&O Canal Aqueducts

The C&O Canal's eleven aqueducts are indeed works of art. Erie Canal historian Ronald Shaw has noted that the aqueducts "...on the Chesapeake and Ohio Canal were among the most beautiful and best constructed in the nation..."[30] Aqueduct designs across other systems varied greatly. For example, nearly

all the aqueducts on the James River and Kanawha system used stone abutments, with a wooden trough or flume to carry the canal over a watercourse. This differs from the Pennsylvania Mainline Canal, which featured suspension aqueducts, with wooden troughs supported by masonry towers and abutments. The Erie Canal, however, did largely use stone aqueducts in its construction.

Like the Erie Canal, the C&O Canal Company chose to construct masonry aqueducts. Seneca Creek Aqueduct or Aqueduct No. 1 was the first constructed along the system and was finished in 1831. Built of Seneca Red Sandstone, it features three equal elliptical arches and has Lift Lock No. 24 (Rileys Lock) incorporated into the downstream end of the structure.

Aqueduct No. 2, the Monocacy River Aqueduct was built between 1831 and 1833 and is the longest aqueduct on the C&O system. It features seven equal elliptical arches and was constructed of pink and white quartz sandstone. This stone was quarried four miles away and conveyed to the site on a tramroad built by the canal company. Aqueduct No. 2 is considered to be the finest engineered structure along the canal.

The third aqueduct, Catoctin Creek Aqueduct was completed in 1833. It consists of three elliptical arches, with the largest central arch flanked by two smaller arches. Granite for this structure was quarried at Patapsco, Maryland and transported on the B&O Railroad to the site. This structure was known as the "crooked aqueduct" because of the sharp bend the canal takes as it leaves the lower end of the aqueduct.

Antietam Creek Aqueduct was the fourth aqueduct built by the canal company. Constructed of locally quarried limestone, it features three elliptical arches, with a large central arch flanked by two smaller arches of equal size. Work on this aqueduct began in 1832 and was completed in 1834.

TABLE NO. 2-C&O AQUEDUCTS

Aqueduct	Length*	# Spans	Span Length	Year Built
No. 1 Seneca Creek	126 ft	3	33 ft	1831
No. 2 Monocacy River	516 ft	7	54 ft	1833
No. 3 Catoctin Creek	130 ft	3	2 @ 20 ft 1 @ 40 ft	1833
No. 4 Antietam Creek	140 ft	3	2 @ 28 ft 1 @ 40 ft	1834
No. 5 Conococheague Creek	196 ft	3	60 ft	1834

*Abutment to abutment
Compiled from Historic American Buildings Survey drawings and

Home on the Canal.

Williamsport

By the time the C&O Canal reached Williamsport in 1835, the Potomac River town was well-established. Settlement at the mouth of the Conococheague Creek began when Native-Americans first settled there in the Late Woodland Period (ca900-1600 AD) and established a village. The location, with its high ground and shallow Potomac crossing, was well-suited for a village. The first Europeans, probably trappers, passed through the area prior to the 1730s. White settlement of the area began about 1732 when Scotch-Irish, Germans, and English settlers migrated into the region from Pennsylvania, and established the first permanent settlement called Conococheague. These early inhabitants resided on Lord Baltimore's estate, called the Manor of Conococheague and Reserve, who leased various tracts.[31]

In 1739, Jeremiah Jack received a royal grant for 175 acres, called "Jack's Bottom," and Charles Friend made the first legal acquisition, a 260-acre tract he called "Sweets Delight." Over the next forty years, the outlying land near present-day Williamsport was slowly purchased. Jacob Friend, in 1780, bought the last 1-3/4 acre tract, which he apparently named "None Left."[32]

In the early 1780s, Revolutionary General Otho Holland Williams acquired in fee all the parcels of land around the mouth of Conococheague Creek. In 1786, he established the town of William's Port, later incorporated by the state of Maryland. Situated south of the Conococheague on the high ground above the Potomac, Williams' laid out the town on a grid, with sixty-foot wide streets, small alleys, and rectangular lots. In his design, Williams' located his town at the junction of roads leading to Winchester, Sharpsburg, Hagerstown, Martinsburg, and Frederick. Further, the town was located at an important Potomac River crossing that connected Virginia's Shenandoah Valley with Pennsylvania's Cumberland Valley. Moreover, Williams planned to exploit the navigational improvements planned by the Potowmack Company; hence the name William's Port. Williamsport's location boded very well for a future center for commerce and trade, and in the 1790s, was nearly selected as the site for the new national capitol.[33]

Williamsport gained prominence as an important river port because of the Potowmack Company's improvements. Upper Potomac Valley farmers shipped their wheat to Williamsport for milling and the flour was boated to Georgetown. The Potowmack Company's improvements, while not perfect, facilitated the shipment of flour down river and Williamsport developed into a thriving river town. The Conococheague Creek was also a natural highway into the rich agricultural lands to the north and in circa 1810, the Potowmack Company improved the Conococheague for fifteen miles upstream by removing obstacles and deepening the channel.[34]

From about 1810 to the late 1820s, boat trade between Williamsport and Georgetown increased as the town's importance as a trade center grew. At the end of the decade, the town was

larger than Sharpsburg, Hancock, or Boonsboro, and boasted not only grist and merchant mills, but tanneries, lumber yards, and several large stores. With its continued prosperity at heart, Williamsport began to agitate for the canal in the 1820s. When the C&O Canal became a reality, the town began a program of civic improvement.[35] Situated near the half-way point of the C&O Canal, Williamsport was destined to be an important canal town.

Construction of the Conococheague Creek Aqueduct

In January 1832, the President and Directors of the canal company resolved that the canal line between Harpers Ferry and Dam No. 5, just above Williamsport, be advertised for contract on April 4, 1832. They ordered Resident Engineers Alfred Cruger and Thomas F. Purcell to survey the line and prepare cost estimates for each of the sections laid out. The canal company recognized that the work above Harpers Ferry would be difficult and expensive because it involved "heavy embankment, steep side cutting, deep cutting, and rock excavation."[36] The combination of extremely severe winter weather and high water thwarted the survey party's efforts, and the President and Directors rescinded the order to advertise the sections.[37] At the end of April, after the weather cleared, the President and Directors ordered the engineers to continue with the canal line survey.[38]

While the engineers surveyed and laid out the line of the canal in early summer 1832, the President and Directors took up the matter of reducing canal construction costs. They considered deferring construction of Dam No. 3 at Harpers Ferry until 1834 and the substitution of a wooden flume in place of a masonry aqueduct across Antietam Creek to save costs. Perhaps their most interesting cost saving idea was the construction a suspension aqueduct across the Conococheague. The canal company, however, chose to construct masonry aqueducts along the line.[39]

Resident Engineer Purcell reported to President Mercer in July 1832, that fifteen miles of canal from the mouth of Opequon Creek to Dam No. 5 had been surveyed and were ready to be let. He noted that the construction work on these sections included five masonry locks with a combined lift of forty-five feet, Dam

No. 5, and Aqueduct No. 5, which was to cross Conococheague Creek on three spans. The President and the Directors met on July 5, 1832 and agreed to advertise Sections 173 to 202 inclusive for letting on August 10, with the caveat that the work on these sections be completed within twelve months time.[40] Two weeks later the President and the Directors amended their decision and resolved that Sections 173 to 202 inclusive be advertised for letting on August 23.[41]

On July 28, 1832, the Williamsport Republican Banner ran an advertisement for the letting of Sections 173 to 202. The notification echoed the President and Directors earlier resolution and stated:

> Proposals will also be received, at the same time, for the construction of an Aqueduct across the Conococheague; four Lift Locks, a Guard Lock, and sixteen Culverts [and] a plan of the Dam, Aqueduct, and Locks, with the specifications of the same, may be seen at this office [Washington] and on application to the Resident Engineer at Williamsport, after the first day of August.[42]

On Saturday August 25, 1832, the President and the Directors met and agreed to award Sections 173 to 202. Despite the objections of Director Walter Smith that the canal company should postpone letting of the contracts until it was on a more secure financial footing, William and Michael Bryne and Paul Provest, a contracting consortium, were awarded the contracts for "Sections 173 and 187 to 200 inclusive-together with Dam No 5, Aqueduct No 5 and all the Locks and Culverts." The Board modified their proposal slightly before accepting it, but it is not clear what was modified.[43]

Preliminary construction on the Conococheague Creek Aqueduct probably commenced that summer, but a cholera epidemic, which erupted that autumn, ceased all canal construction as the workforce scattered in terror. The epidemic first appeared along the canal line near Harpers Ferry and spread quickly up and down the river, suspending work.[44]

The following spring work resumed on the canal and Michael Bryne & Company began work on Aqueduct No. 5. Byrne enjoyed a fine reputation along the canal for quality work and for being a responsible contractor. Further, unlike many of his contemporary contractors, Byrne never went bankrupt. His crews had constructed the Monocacy Aqueduct and many lift locks including the nearby Lock No. 44. Byrne's company would later be awarded the contract to finish the Paw Paw Tunnel and to complete other lingering construction projects.

Work began on Aqueduct No. 5 without clear title to the land. In mid-June 1832, the President and Directors appointed attorney James Price to make agreements with Washington County, Maryland landowners for canal rights-of-way. If unable to reach equatable terms, Price was to initiate condemnation proceedings.[45] Unfortunately for the canal company, most landowners refused to sell at the price the company offered, instead opting for arbitration. Ann and Mary Williams owned the land fronting the Potomac River. Their inquisition was held in January 1833 and in April 1834, the Williams' were awarded damages amounting to $158.00, plus an additional $80.00 for dirt taken for an embankment.[46] This property probably included Section 188, where Aqueduct No. 5 was being built.

Resident Engineer Thomas F. Purcell designed the Conococheague Creek Aqueduct. Little is known about Purcell's training, but after his appointment as a Resident Engineer in 1828, he was involved in every aspect of the canal's design and construction. He resigned in 1836 following a dispute with Resident Engineer Charles Fisk.[47]

When the House of Representatives Committee on Roads and Canals took up the matter of authorizing further subscriptions for the C&O Canal Company, they assigned Topological Engineer Captain William Gibbs McNeill the task of inspecting the canal and in April 1834, he submitted his report. McNeill learned from Purcell the general specifications for Aqueduct No. 5 then under construction. Purcell noted that it was to be:

> ...founded on the solid rock which, fortunately, forms the bed of the creek; and from these spring three arches of sixty feet span each, the versed sine of which is fifteen feet. The masonry, of which the aqueduct will include 4,900 perches, is of the character denominated "rock work," excepting the pilasters, ring stones, sheeting, water table and inside of the parapets, which will be cutstone....[and] it will be built of compact blue lime stone of excellent quality...[48]

The original specifications for the Conococheague Creek Aqueduct called for the use of hammer dressed stone for the inside of the trough parapets.[49] The canal company adopted a specification in July 1832 that stated all face stone employed above Point of Rocks should be hammer dressed rather than cut stone, but only at the discretion of the Resident Engineer.[50] In November 1833, Purcell altered the aqueduct specifications in favor of using cut stone for the inside face of the aqueduct's parapet walls. After Purcell submitted an estimate of $520.00 for the additional costs, the President and Directors authorized the modified specification.[51] Purcell's decision was probably predicated on the need for smooth flume walls, which would less likely damage passing canal boats.

Because Williamsport was such an important and prosperous town, Purcell's aqueduct design was more elaborate than any of the previous four constructed.[52] The most noticeable refinement was the addition of engaged pilasters, an architectural detail that featured ornate capitals. Purcell apparently ordered the change in late August or early September 1833, and the President and the Directors, after some discussion, approved the modification to the original specifications in early November 1833.[53] A second refinement was the addition of bull nose piers.

Change orders were not the only concern of Resident Engineer Purcell. The erratic supply of hydraulic cement was a frequent problem for the canal builders, not only at Williamsport, but along the entire canal. The Boteler and Reynolds cement mill located near Shepherdstown, Virginia supplied much of the cement

used in the canal's construction until 1837, when the Round Top cement mill was established at Hancock, Maryland. While Boteler and Reynolds supplied quality cement, the waterpowered plant operated seasonally, which led to cement shortages and the use of old cement along the line. Early in the aqueduct's construction, Purcell complained to the President and Directors of the difficulty of obtaining "in season" cement. Purcell, in an attempt to remedy the situation, made an arrangement with the Van Sears Mill located at Williamsport to grind and deliver cement to the aqueduct and to nearby Lock 44, also under construction, before the first of September 1833 at the price of two cents per bushel.[54] It is unclear whether or not the engineer executed this agreement, but it was likely that Boteler and Reynolds supplied most of the hydraulic cement required for the Conococheague Creek Aqueduct.

Stone for Aqueduct No. 5 was quarried at High Rock Quarry (present-day Pinesburg Quarry), located three miles away from Williamsport. A contemporary Williamsport newspaper reported that the stone used for the aqueduct was "scarcely inferior to granite [and is] found on the lands of Mr. Wm. Towson...from which the stone is taken by the process of splitting, in blocks of great size."[55] While Michael Byrne and Company built a tramroad for the delivery of stone to the Monocacy Aqueduct,[56] there is no evidence that a similar road was used in the construction of the Conococheague Creek Aqueduct.

In late August, Edward Fielding submitted his final estimate for the "walls adjoining the wings of Aqueduct No. 5," which the canal company accepted and ordered paid.[57] A month later, the Republican Banner credited Fielding for building the aqueduct, who probably sub-contracted all or part of the aqueduct's construction from Michael Byrne and Company.[58]

By September 1834, Michael Byrne and Company had completed its work on the aqueduct. Later that month, the company submitted its final estimate to the President and Directors, who returned it to Purcell for explanation of the extra charges included (probably related to cement costs). In mid-November Purcell clarified these additional costs and they passed the

estimate. A month later Michael Byrne and Company sent the President and Directors a letter stating that the company had completed its contracts and wished to be paid, to which the company agreed.[59] Although Michael Byrne and Company's role in building the aqueduct was finished, the aqueduct itself still required additional work.

The company took up the matter of a railing for the aqueduct in November 1834. Purcell submitted specifications for the railing which called for cast iron, but the President and Directors objected to cast iron and, instead, specified wrought iron. In February 1835, Purcell forwarded to the President and Directors a proposal from the firm of Uhler and Hughes to construct the railing. They rejected it and directed Purcell to submit plans and specifications for the railing. In March, Purcell transmitted the revised plans and specifications to the company and on March 25 they approved of Uhler and Hughes' proposal. Work on the railing began, immediately, and in late May the company approved Uhler and Hughes final estimate, ordering it paid.[60] In addition to the railing, a mule curb, a low wood rail, was installed on the top of the coping stones to keep animals from falling into the aqueduct.

Although water was admitted into Aqueduct No. 5 in early April, minor construction remained as well.[61] James Hughes was contracted in March 1835 to reinforce the embankment at the south end of the aqueduct and William Brown constructed the walling at the aqueduct in the fall of 1835.[62] With the fulfillment of these two contracts, the Conococheague Creek Aqueduct was finally finished. In 1832 Purcell had estimated that the aqueduct would cost $40,260.[63] The final cost including the railing came to $66,759.79 a mere $26,499.79 over the original estimate.[64]

Conococheague Creek Aqueduct in the Civil War

The C&O Canal suffered greatly during the Civil War. The waterway not only delineated the boundary between North and South, but was of strategic importance to both the North and South, as well, and was the object of many raids. The

Conococheague Creek Aqueduct and Williamsport were the focus of several military incursions during the conflict.

During the second year of the war, Williamsport and the aqueduct became a military target. Early in the Battle of Antietam on September 17, 1862, Union General George B. McClelland sent Captain Charles H. Russell and his 1st Maryland Cavalry to Williamsport with orders to burn the pivot bridge at Lock 44 and to destroy the aqueduct. The troopers arrived at Williamsport and burned the bridge and eleven canal boats. Then, Russell's men tried to wreck the aqueduct and failing, returned to the battle then raging at Sharpsburg.[65]

The next raid on the Conococheague Creek Aqueduct occurred following the Battle of Gettysburg (July 1-3, 1863). Lee's Army of Northern Virginia planned to cross the Potomac at Williamsport, but high water stalled the retreat for several days and the Confederates formed a battle line waiting for the water to recede. During this lull, the rebels pillaged canal property. Jacob B. Masters, Williamsport Division Superintendent, reported to the President and Directors on August 4 that the Confederates' damage to the aqueduct consisted of:

> tearing down to the bottom the 4 corners of the aqueduct, an aggregate space of 74 feet, all the coping & railing was thrown into the creek & partly destroyed, An opening in one of the arches was made nearly the width of the aqueduct & 6 or 10 feet wide.[66]

Earlier on August 1, C&O Canal Director A.C. Greene wrote Company Clerk Walter S. Ringgold that:

> Mr. Masters writes me that he is permanently replacing the mason work on the tow path side of Conococheague Aqueduct, but that he will probably make temporary repairs on the berm side.[67]

Construction materials and labor were scarce, but Masters slowly began making repairs to the aqueduct. He continued in his report to the President and Directors that:

> The repairs of the aqueduct is [sic] progressing as fast as possible. I will have it rebuilt with masonry as high as the water mark, or as far as the stone on hand will rebuild it...The other repairs on this division will also be done by the time the aqueduct can be finished which I expect to take until about the 8th of Aug.[68]

Canal traffic at Williamsport resumed about August 8 and a calm settled over the region as the war moved into the deep South. The calm was short-lived, however, because in the spring of 1864, Rebel raiders began crossing the Potomac at Williamsport on forays for livestock and provisions. These raids continued into the summer, nearly bringing canal traffic to a halt. On August 5 the rebel marauders crossed the Potomac and attempted to destroy the Conococheague Creek Aqueduct, but only damaged the upper end of the downstream side. The pall of Confederate raids hampered the speedy repair of the aqueduct as rumors of raids frequently scattered the Masters' workforce.[69] The repairs to the aqueduct and canal were finally completed and navigation on the Williamsport Division was restored by the end of August, although Dam No. 5 leaked so badly that it could not adequately water the canal.[70] Following the August raid, the theater of war again shifted into the South and business slowly returned to the canal.

As the Civil War slowly wound down in the late winter of 1865, the ravages of time and warfare had taken their toll on Aqueduct No. 5. On March 6, 1865 Jacob Masters wrote Walter Ringgold that:

> On Sunday morning [March 5] just before daylight all of the upper or north side of the Williamsport Aqueduct fell into the creek, except the two corners repaired in 1863.[71]

Masters went on to offer reasons why the parapet failed. He speculated that because there had been a crack in the berm wall for six or eight years, combined with effects of the freezing

winter, and the repeated assaults by Confederate forces to destroy the aqueduct, the wall collapsed.[72]

Masters immediately began repairs to the aqueduct and proposed erecting a wooden trunk to replace the fallen wall. He reported to Ringgold that he could not estimate the time required to restore the aqueduct, but hoped it would be finished by the 20th or 25th of March.[73] Masters' crews worked rapidly and in spite of rising water and bad weather, finished restoring the aqueduct at 12 o'clock on March 17.[74] Water was let into the canal on the evening of March 26, and Masters reported that there were no problems arising with the new construction.[75]

Masters wrote to Ringgold with the details of the aqueduct repairs. He noted that the finished wooden flume measured 155 feet long and gave the following construction description:

> ...in the openings we laid down 16 sills 7 ½ feet apart, 25 feet long 10 by 12 in size, level with the floor, and filled in with small stone and grouted, using 48 bushels of cement. The side us built up with logs sawed in two so as to show a six inch face, Bolted up and down with from 16 to 20 Bolts, and also bolted through the side into the upright posts with 12 inch bolts, the whole length of the inside is sheeted as to prevent leaking, also a new tight floor on the bottom. The work is strong and will last a long time with little repair.[76]

Despite Masters belief that the aqueduct repairs would last a long time, they were temporary at best.

Conococheague Aqueduct: 1866-1920

The Civil War placed a heavy toll on the C&O Canal, leaving the system a wreck at the end of the hostilities. Yet, inflation during the war years enabled the canal company to increase tolls and this led to increased profits for the years 1863-65. After the war, soaring annual revenues enabled the canal company to make the repairs and improvements necessary to restore the C&O

Canal to its 1850 condition. Furthermore, these profits permitted the canal company to begin retiring its debts from the construction years. The new prosperity enjoyed by the C&O Canal Company from 1870 to 1889 has been called the "golden age of the canal."[77] It would be the golden age for the Conococheague Creek Aqueduct, too.

The state of Maryland controlled the C&O Canal Company stock, and in the late nineteenth century, a patronage system existed, where the "old boys" controlled the affairs of the canal company. This frequently resulted in the election of new company officers at the annual stockholders meeting held each June. Thus, at the first monthly meeting of the newly elected President and Directors, held on July 9, 1869, President Josiah Gordon appointed a committee consisting of Directors James Coudy, Jacob H. Grove, and Arthur P. Gorman to oversee the construction of Dam No. 5 and to "procur [sic] materials for the repair of the Aqueduct at Wmport."[78] The administration apparently secured these materials and directed Chief Engineer William R. Hutton to inspect the canal line and estimate the cost of restoring the canal to a good working order. Hutton in a July 1869 letter to the President and Directors noted the state of the aqueduct:

> [The] Conococheague Aqueduct at Williamsport is in a very dilapidated. It is composed of three arches the first and third of which have cracked parallel with and about 4 ft from the upper face. In the central arch this cracked portion has been thrown off together with the parapet wall for two third of its whole length & the portions of the parapet still standing are badly cracked & out of line. This occurred some years ago as I am informed, and the water way was in 1865 temporarily rebuilt in wood-which still stands-and appears to be sufficiently sound to last the remainder of the season. If any failure should occur within the timber work or in the remaining portion of the parapet wall materials are at hand for their immediate repair-without drawing off the water nothing can be done to strengthen them more than the addition of a few braces

> which the superintendent has been instructed to put in.[79]

In June 1870, a new administration was elected and Hutton submitted his canal inspection report to the new President and Directors. In his report, Hutton recommended the complete renovation of the system including the canal prism, locks, and aqueducts, particularly Aqueduct No. 5. He estimated that the entire work would cost $78,000. Hutton further stated that this important work must begin during the summer of 1870.[80]

Restoration work on the Conococheague Creek Aqueduct began in late December 1870 or early January 1871. Canal company president James C. Clarke wrote Hutton in early December and reported:

> In reference to Wmport Aqueduct I propose to build up the masonry as soon as the water is drawn off. I have had a large quantity of stone brought up from Big Slack Water and have had such Cut as are necessary for the inside of the parapet wall, the sand cement and all other materials are on hand. I propose to draw the water from the canal on the 20th Dec.[81]

Clarke, at the December 1870 meeting of the President and Directors, reported that the canal company expended $604.37 on Aqueduct No. 5, the bulk of which was probably spent on the cutting and delivery of stone, sand, and cement.[82] Expenditures on the aqueduct continued through the spring and summer of 1871 and it was apparently completed in August 1871 at a cost approaching $5,000.[83] The repairs consisted of rebuilding the berm wall and perhaps the wing walls. Further, the aqueduct probably used a wooden flume to sustain navigation on the system while the lengthy repairs were made.[84]

In December 1871 Chief Engineer Hutton submitted his final report on the restoration of the C&O Canal and glowingly stated:

> The winter of 1870-71 was, on the contrary extremely unfavorable for work, nevertheless the Canal was much

> improved in condition, and several important and expensive structures were completed. Among these I refer to the restoration of Williamsport Aqueduct...[85]

The berm wall of the Aqueduct No.5, however, continued to be problematic. In 1887, perhaps during the particularly severe spring freshets, a portion of the southern end of the berm wall collapsed. The breach was quickly repaired and the canal company resumed operations.[86]

Although the Flood of 1889 devastated the C&O Canal, the 1870-71 and 1887 repairs to the aqueduct were probably the last major renovation undertaken on the Conococheague Creek Aqueduct until 1920. Crisis management was the order of the day for the C&O Canal Company and the aqueduct probably received minimal maintenance during the next fifty years.

Reconstruction of the Berm Wall

Early on the morning of April 20, 1920, Captain Frank Myers had just unloaded his cargo of coal at Cushwa's Wharf and was returning to Cumberland. As Boat No. 73 entered the south end of the Conococheague Creek Aqueduct, the bow of the barge nudged the berm wall, causing the wall to waver for a moment and then collapse. The gaping breach created a waterfall that washed the canal boat into the creek, where it remained until the Flood of 1936. The break shut down the canal for several weeks.[87]

Once the flow of water was stopped and the damage assessed, the problem of repairing the aqueduct and restoring service remained. To this end the canal company combined old and new construction technologies. The canal company was presented with the problem of either rebuilding the masonry berm wall, a costly and time consuming solution, or to erect a wooden wall, a less expensive but more traditional method of construction. Timber construction was a proven technology for aqueduct reconstruction as illustrated by the 1865 rebuilding of the berm wall, and the company chose the later plan. What sets this reconstruction apart from traditional methods was the use of poured concrete.

Rehabilitation of the aqueduct began almost immediately. Contractors from Baltimore first removed the aqueduct's wooden floor and other remnants of the flume down to the water table level. The workers then built a flooring system. They used roughly hewn log joists, approximately ten inch square by twenty-two feet long, placing them at four foot intervals on the aqueduct's floor.[88] Vertical posts, timbers approximately ten inch square by seven feet long and mitered at one end with a tendon on the other, were driven into mortises let into the horizontal timbers, placed along the centerline of the new wall. To strengthen the flooring system, perpendicular bridging was added between the horizontal timbers at about three feet from the end of the timbers. Diagonal braces were added to give the wall lateral strength. To tie the flooring system to the aqueduct floor, plain unreinforced concrete was placed in the voids between the horizontal timbers, until level with the top of the timbers. Tying the system to the remaining parapet wall were concrete piers cast around each end post. Additional concrete was placed on the face of the south and center arch rings and to the spandrel in-fill to aid in stabilizing them.[89]

The wall system consisted of horizontal planking twelve to fourteen inches wide by five to six inches thick and spiked to the vertical posts.[90] To make the joints water tight, they were probably sealed with tar. The end piers were probably made water tight with the additional packing between the existing parapet wall and the concrete.

The repairs on the Conococheague Creek Aqueduct were probably completed in the last part of May 1920. An inscription in the concrete dates that work at May 18, 1920, so the aqueduct was probably back in service by late May 1920.

Conococheague Creek Aqueduct Since 1924

After the spring flood of 1924, the canal, for all practical purposes, was abandoned. With the exception of the lower canal at Georgetown, the waterway languished untouched until 1938, when the C&O Canal became a unit in the National Park System. From 1938 to the present, the Conococheague Creek Aqueduct has only

received minimal maintenance, mostly in the form of stabilization.

The first stabilization of Aqueduct No. 5 occurred in 1962, with the addition of strongback braces. Three braces were added to each of the arches to stabilize the arch rings.[91] It was probably at this time that concrete was used to replace the missing coping stones on the towpath wall.

In 1978, John Milner and Associates in conjunction with Edward H. Richardson and Associates, produced a stabilization study for the Conococheague Creek Aqueduct. Their report became the basis of the most recent stabilization and restoration efforts. In the early 1980s, the collapsed wing walls were reconstructed and concrete capstones were added to the pilasters replacing the missing stones. The aqueduct's stone work was also repointed in this era.[92]

Conclusion

The Conococheague Creek Aqueduct design and construction are representative of the high state of civil engineering in the American canal building era. Moreover, its completion in 1834 marked the end of high-style aqueduct design on the C&O Canal and ushered in a period of more austere designs. Significantly, Aqueduct No. 5 remains as a important artifact of the United States' canal mania era.

APPENDIX A: ARCHITECTURAL DESCRIPTION

The Conococheague Creek Aqueduct is a three arch span constructed of blue limestone, and unless otherwise noted, all stone work is ashlar with rock faces and regularly coursed. The aqueduct is sited northeast to southwest, but for all practical purposes can be assumed to be north and south. The downstream or west elevation carries the towpath, while the upstream or east elevation carries the berm wall.

Downstream Elevation: The downstream elevation of the aqueduct consists of three sections: wingwalls, abutments, and arches. The wingwalls feature exterior and interior walls both of which are of uncoursed rubble construction. The abutments feature parapet walls resting on a projecting water table or belt course. At each end of the aqueduct, where the exterior wingwall joins the abutment there are engaged pilasters. The aqueduct's central arch springs from flanking bull-nosed (rounded) piers, while the two outer arches each spring from a pier and a abutment. The arch ringcourses or voussoirs are ashlar with tooled faces. The inside of the arches or barrels are hand tooled cutstone. The spandrel walls rise on top of the arches and are capped by the projecting water table which marks the aqueduct's floor. On top of the water table, the parapet walls rise four courses high and are topped with coping stones. The interior of the parapet walls are cut stone. At the north end of the aqueduct, there is patch in the parapet wall which was repaired using smaller regularly coursed cut stone, but omits the water table and the upper part of the pilaster. Flanking each arch is a cut stone pilaster featuring a capital with the center pilasters resting on the bull-noses.

Upstream Elevation: The upstream elevation originally mirrored the downstream facade of the aqueduct, but nature and time have greatly altered this elevation. When the canal company rebuilt the berm wall in 1871, they omitted the pilasters and water table details, as cost saving measures. In 1920 when this facade collapsed it was not rebuilt in masonry, but in timber. The wingwalls and abutments remain at each end of the aqueduct, while the most of the parapet wall is gone, with the exception of

a small portion at the south end. The collapsed state of the upstream side however does reveal the floor of the aqueduct and the spandrel in-fill. Many of the ringcourse stones also remain and at the south end were stabilized in 1920 with concrete.

APPENDIX B: SPECIFICATIONS

***Specifications of the manner of constructing Aqueduct No. 5, designed to convey the water of the Chesapeake and Ohio Canal over Conococheague creek.**

The aqueduct will be formed with three arched water ways of sixty feet span each.

There will be two piers and two abutments, the piers will be twelve feet thick at the bottom, and eight feet at the top of the skewback; the abutments will be, each twelve feet thick, with a buttress projecting five feet from the centre, as represented on the annexed plan. The piers, abutments, and wing walls shall all be founded on solid rock that forms the bed of the creek.

The piers will be thirty-two feet long, exclusive of the dome at either end thereof, and these domes will be quarter spheres of eight feet diameter; the piers and abutments will be carried up until within eighteen feet (measured vertically) of the bottom of the canal.

On these piers and abutments will then be erected three arches, thirty-two feet wide, sixty feet span, and fifteen feet rise; the arch stones, or voussoirs, must be of hard, durable stone, and fashioned so, that the first or skewback course, composed of them, shall be three feet, and the crown or key course two and a half feet deep; and these arch stones shall not be less than fourteen inches thick at the nose, or intrados; they must also be so laid in the work, as to break joints, no lap being less than twelve inches, nor shall any arch stone be less than three feet long on its face. The spandrils shall be laid of good large flat stone; and the arches and spandrils shall be grouted in the manner hereinafter mentioned.

On the arches and spandrils shall be erected the parapet walls as follows: the parapet on the towpath side to be seven feet thick at the bottom and six and a half feet at the top; and that on the berm side to be five thick at the bottom , and four and a half feet at the top, and both walls to be raised seven feet above the bottom of the canal.

On the exterior sides of the aqueduct, and between the top of the arches and the parapets, will be inserted a water table or string course, eight inches thick in the main, levelled six inches on the face, and the whole to be two feet broad, and project six inches beyond the face of the parapet.

The parapet and wing walls will be covered with a coping stone ten inches thick, and projecting on the exterior surface of the wall six inches.

The wing walls shall be built of the form and thickness shown on the annexed plan, and the manner of building them shall be similar to that prescribed for the parapets.

The stone for the arches, ends of the piers and abutments, the skewback, the water table, the domes and coping of the parapets and wings, shall be well and smoothly cut, and all the remaining face stone, both for the waterways and exterior faces, shall be of good hammer-dressed range work.

No course of stone will be permitted to enter either the abutments or piers, that shall be less than fourteen inches thick, with a bed two feet broad; nor will any course be permitted to enter any part of the work, that shall be less than ten inches thick, and have a bed less than eighteen inches broad. There must be a header or bond stone at each ten feet in length of every course, and each header must be at least three feet long on the face.

The bottom of the trunk (or waterway) between the parapet walls shall be laid with approved hard burned brick, laid on edge, and bedded in a good bed of cement mortar, one inch deep, and the grout made to fill between the bricks half an inch above their upper side. This floor of brick to extend entirely between the parapets, and from outside of the abutments.

The whole of the masonry shall be laid in cement mortar or grouted, or both, as may be directed by the engineer; the grout and mortar shall be composed of equal parts of clear, sharp sand and approved hydraulic lime, except the wings, in which grout may be composed of two parts sand to one of water lime. The grouting shall be done at each course in height as the walls progress. Iron rods and clamps, to connect the arch and other stones, shall be inserted when required by the engineers, and every part of the work shall be done under his inspection, and any part thereof taken down and rebuilt that he shall not approve.

*"Document B," Report of the Committee on Roads and Canals on the Chesapeake and Ohio Canal, April 17, 1834, 23rd Cong., 1st sess., House of Representatives, Report No. 414. pp. 162-63.

**Specifications of the Manner of constructing the Railing on Aqueduct No. 5.

The material of which the railing shall be composed must be wrought iron of approved quality.

The upright bars must [be] 4[-]½ feet long each, & 7/8ths of an inch diameter-each bar will be sunk four inches into the stone coping.

At each 8 feet in length of the railing there will be a square bar 1[-]½ inches square and to be supported on

the outside by a brace one inch square, as shown in the accompanying plan. The rail will be 3[-]½ broad & 5/8ths of an inch thick--the laps for this rail must always be made [from] one of the square bars above mentioned--cast iron heads must be secured on each of the said square bars. The uprights must be fastened to the coping either by running Lead, or a mixture of Sulphur & sand into the holes.

The whole to be executed in a substantial & workmanlike manner to the satisfaction of the Engineer.

afterwards altered by the board

**Quoted in John F. Luzader, "Historic Structures Report, Conococheague Aqueduct, Chesapeake and Ohio Canal, Part I: Historical Data Section," pp. 5-6.

APPENDIX C: CONSTRUCTION COSTS

Quantities and Price as Recorded by Thomas F. Purcell

Item	Unit Cost	Quantity	Total
AQUEDUCT	**CONSTRUCTION**	**COSTS**	
Bailing Water & Coffer Dams			$315.00
Centering			1,500.00
Cubic Yards Excavation for Foundation	$0.20	1,250	250.00
Sup'l Feet Rough Ashlar delivered	0.30	1,041	312.00
Sup'l feet Cut Ashlar delivered	0.50	1,041	520.50
Sup'l feet Scabbled Ashlar delivered	0.40	11,461	4,584.40
Sup'l feet Rough Sheeting	0.60	7,861	4,710.60
Sup'l feet Cut Sheeting	1.00	7,861	7,861.00
Sup'l feet Rough Coping	0.30	4,381	1,314.30
Sup'l feet Cut Coping	0.55	4,381	2,409.55
Sup'l feet Stone in Domes & Ends of Piers	1.25	376	470.00
Perches Packing	1.40	3,487	4,881.80

Bushels of Cement Delivered	0.36	15,276	5,499.36
Bushels of Sand delivered	0.04	15,276	611.04
Ft B M Scantling & plank p m	0.18	14,128	254.30
Perches Masonry laid at	1.00	5,092	5,092.00
Sq. Ft Cut Stone in Pilaster Capitals	0.55	2,220	1,221.20
Sq. Ft Cut Stone in Parapets changed from Scabbled to cut	0.16	3,256	520.96
Iron in Clamps and Wedges p lb	0.10	2,012	201.20
Pointing & laying Plank &c	10.00/cwt	14,128	141.28
Perches of Masonry laid at	8.00/perch	5,101.50	40,812.00
Ft hammer dressed stone changed to cut work on inside of parapets	0.16	3,358	537.28
Sq. Ft cut work on Pilasters	0.65	2,352	1,528.80
Llbs Iron for Clamps & Dowels	0.10	2,462	246.20
For Cutting holes for Dowels &c			108.00

Timber used in Wings for Sheet-piling			19.50
Extra Labor in sinking Puddle ditches for Pilasters			32.00
	Aqueduct	Total	$85,954.57

RAILING	CONSTRUCTION	COSTS	
For the Railing Lbs Iron in Railing	0.075	8,909	667.80
Llbs Lead for fastening	0.08	359.75	28.78
Holes drilled in coping	0.06	464	27.84
For passing the rails (while hot) through oil to prevent oxidation			25.00
	Railing	Total	$749.42
		TOTAL	$86,703.99

Quoted in Luzader, "Conococheague Aqueduct," pp. 7-9.

Note: There is a discrepancy between the sum of listed by Luzader-- $65,960.37 for the aqueduct's construction costs and the actual summation of the above figures--$85,954.57. This is a difference of $19,944.20.

APPENDIX D: ILLUSTRATIONS
(see field records for historic engineering sketches)

To Contractors.

OFFICE OF THE CHESAPEAKE AND OHIO CANAL COMPANY.

WASHINGTON, July 17th, 1832.

PROPOSALS

WILL be received at this Office until Thursday, the 23d day of August next, for the excavation, embankment, and walling, of thirty sections of the Chesapeake and Ohio Canal, commencing at a point on the Potomac river, eight miles below Williams-Port, and extending up the river fifteen miles.

Proposals will be received, at the same time, for the construction of a Dam across the Potomac river, at the upper termination of the above line, being opposite to the estate of Mr. Colston.

Proposals will also be received, at the same time, for the construction of an Aqueduct across Conococheague; four Lift Locks, a Guard Lock, and sixteen Culverts; all on the above line of Canal.

A plan of the Dam, Aqueduct, and Locks, with the specification of the same, may be seen at this Office, and on application to the Resident Engineer at Williamsport, after the first day of August.

Specifications, and blank forms of proposals for the Sections, Locks, and Culverts, may be obtained either at this Office or at Williams-Port.

Proposals will also be received, until the 23d of August, for the construction of Lock No. 39, of six feet lift, on the 136th section of the Canal; of Lock No. 40, of nine feet lift, on the 145th section of the Canal; and for the excavation, embankment, and walling, of the 116th section of the Canal; all being between the head of Harper's Ferry falls and Galloway's mill. By order:

JOHN P. INGLE,
Clerk C. & O. C. C.

Figure 1: Chesapeake and Ohio Canal Company notice to canal contractors. From the Williamsport Republican Banner, 27 July 1832.

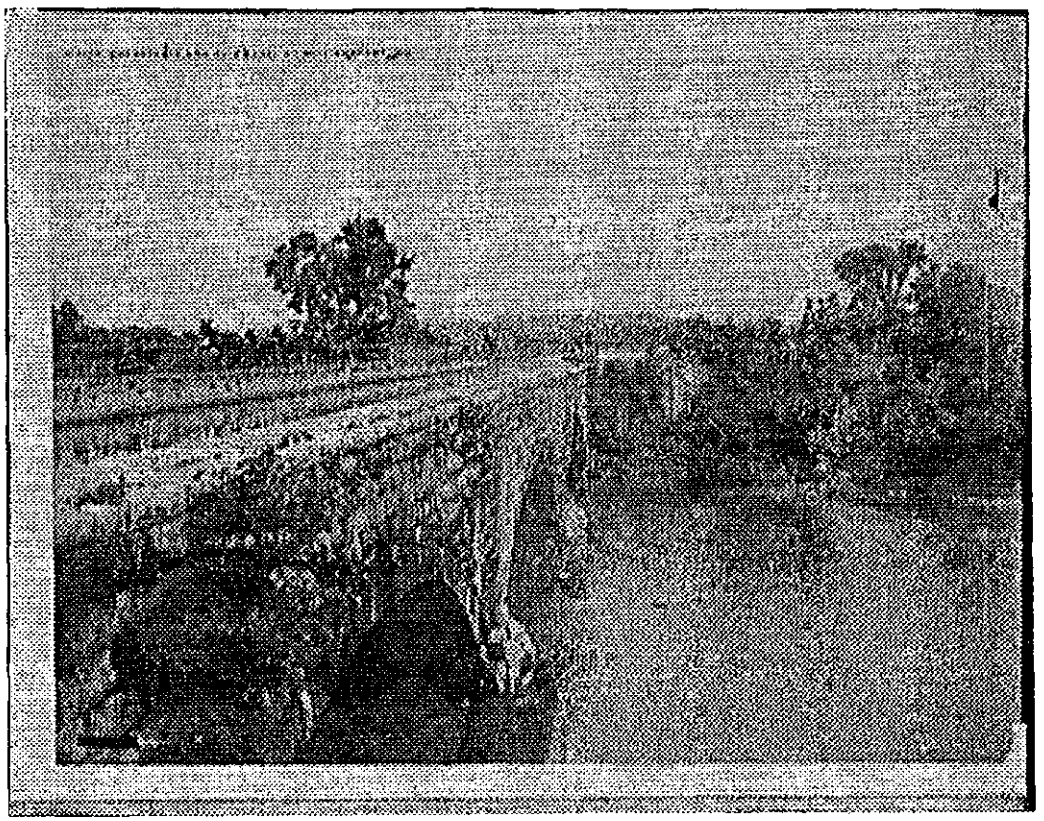

Figure 2: Historic view of the Conococheague Creek Aqueduct (c1903) showing the reconstructed 1871 berm wall. Note the omission of both the pilasters and water table. From Detroit Publishing Co. Collection, Prints and Photographs Division, Library of Congress.

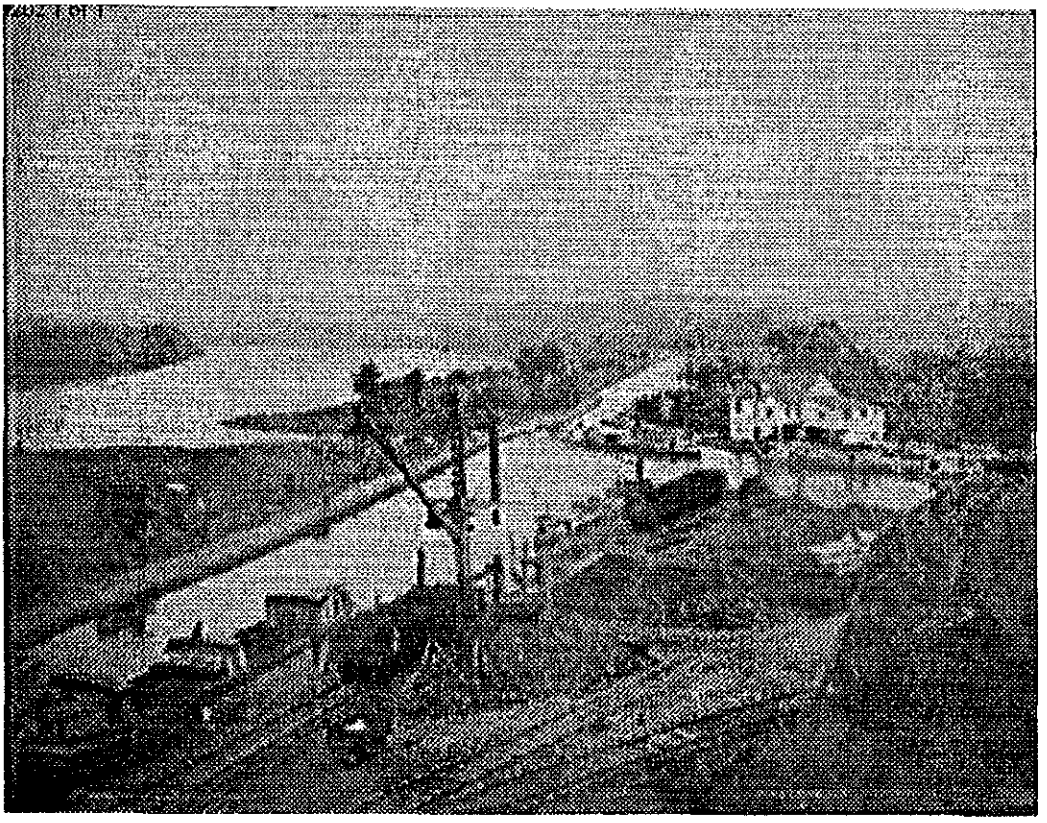

Figure 3: Historic view of the Cushwa Basin with the Conococheague Creek Aqueduct at the center (June 1902). From Detroit Publishing Co. Collection, Prints and Photographs Division, Library of Congress.

ENDNOTES

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2. Report of the Committee on Roads and Canals on the Chesapeake and Ohio Canal, April 17, 1834, 23rd Cong., 1st sess., House of Representatives, Report No. 414, p. 2 (hereafter House Report 414).

3. Sanderlin, Great National Project, p. 19.

4. Julius Rubin, Canal or Railroad? Imitation and Innovation in the Response to the Erie Canal in Philadelphia, Baltimore, and Boston, Transactions of the American Philosophical Society, New Series, Vol. 51, Part 7 (Philadelphia: American Philosophical Society, 1961), p. 63.

5. Sanderlin, Great National Project, pp. 29-31.

6. Ibid, pp. 34-38.

7. Ibid, p. 40.

8. Francis Robb, "Industry in the Potomac River Valley 1760-1860" (Ph.D. Diss., West Virginia University, 1991), pp. 159-60.

9. Sanderlin, The Great National Project, p.. 52-53.

10. Ronald E. Shaw, Canals for a Nation: The Canal Era in the United States 1790-1860 (Lexington: The University Press of Kentucky, 1990), pp. 73-74.

11. Ibid, pp. 112-15.

12. Robb, "Industry in the Potomac River Valley 1760-1860," pp. 169-72.

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15. Robb, "Industry in the Potomac Valley," p. 168.

16. Sanderlin, The Great National Project, pp. 59-60.

17. Ibid, pp. 61-62.

18. Ibid, p. 62.

19. Ibid, p. 66-69.

20. Ibid, pp. 79; 91-92.

21. Ibid, pp. 83-88.

22. Ibid, p. 91.

23. Ibid, pp. 162-63.

24. Journal of the Proceedings of the President and Directors, Vol. C, p. 131-32; Proceedings and Other Records Concerning the Directors and Stockholders; Proceedings of the President and Directors 1828-90; Records of the Chesapeake and Ohio Canal Company, Record Group 79; National Archives, Washington, DC.

25. Sanderlin, The Great National Project, pp. 203-225.

26. Ibid, pp. 234-39.

27. Ibid, pp. 258-71.

28. Ibid, pp. 276-78.

29. Ibid, p. 278.

30. Shaw, Canals for a Nation, p. 175.

31. Land and Community Associates, Cultural Landscape Report: Chesapeake and Ohio Canal National Historical Park, Williamsport, Maryland, Milepost 98.96-99.85 (Charlottesville: np, 1994), p. 2.1; and Edward Smith, "Historic Resources Study: Williamsport, Maryland," (National Park Service, Denver Service Center, National

Capitol Team, 1979), p. 2.

32. Smith, "Williamsport," pp. 2-3.

33. Cultural Landscape Report, pp. 2.2-4; and Smith, "Williamsport," pp. 21-38.

34. Smith, "Williamsport," p. 20.

35. Ibid, pp. 52, 67, 76-78.

36. Journal of the Proceedings of the President and Directors, Vol. C, p. 49; RG 79; NA.

37. 4th Annual Report (1832), in Proceedings of Stockholders, A, p. 204; Proceedings and Other Records Concerning the Director and Stockholders; Proceedings of Stockholders 1828-89; Records of the Chesapeake and Ohio Canal Company, Record Group 79; National Archives, Washington, DC.

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40. Journal of the Proceedings of the President and Directors, Vol C, p. 181-82; RG 79; NA.

41. Journal of the Proceedings of the President and Directors Vol C, p. 188-89; RG 79; NA.

42. Williamsport Republic Banner, 28 July 1832.

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44. 5th Annual Report (1833) quoted in House Report 414, p. 106.

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47. Harlan D. Unrau, "Chronological History of the C&O Canal 1828-1924: An Historical Resource Study," Chap. V, (Unpublished: National Park Service, 1976), pp. 30-31.

48. House Report 414, p. 150.

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61. Williamsport Republican Banner, 4 April 1835.

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63. House Report 414, p. 151.

64. Luzader, "Conococheague Aqueduct," p. 9. There is a discrepancy between this sum and the actual summation of the costs as enumerated by John Luzader in his Historic Structures Report (see Appendix C: Construction Costs). The author is assuming that there was a error in the transcription of these figures and the sum of $66,759.79 is correct.

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70. Masters to Ringgold, 31 August 1864; Letters to the Office of the President and Directors; RG 79; NA.

71. Masters to Ringgold, 6 March 1865; Letters Received at the Office of the President and Directors; RG 79; NA.

72. Ibid.

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77. Sanderlin, The Great National Project, pp. 222-26.

78. Proceedings of the President and Directors, Vol. L, p. 174; Proceedings and Other Records Concerning the Director and Shareholders; Proceedings of the President and Directors 1828-90; Records of the Chesapeake and Ohio Canal Company; Record Group 79; National Archives, Washington, DC.

79. W.R. Hutton to President and Directors, 26 July 1869, Box 16, FF: "W.R. Hutton, C&O Canal, Engineering c1870-1880," Smithsonian Institution.

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81. James C. Clarke to W.R. Hutton, 8 December 1870, Box 16, FF. "C&O Canal, Business Correspondence, c1870-1880," Smithsonian Institution.

82. Proceedings of the President and Directors, Vol. L, p. 390; RG 79; NA.

83. Proceedings of the President and Directors, Vol L, pp. 401, 408, 421, 425, and 450; RG 79; NA. President Clarke reported that $1,348.24 was expended in April, $829.07 in May, 553.93 in July, and $523.17 in August. After no more aqueduct expenses were recorded.

84. Expenditures enumerated in the Proceedings of the President and Directors, Vol. L include costs for both the aqueduct and flume.

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87. Thomas F. Hahn, Towpath Guide to the C&O Canal: Georgetown (Tidelock) to Cumberland (Shepherdstown, WV: American Canal and Transportation Center, 1994), pp. 150-51; and Kytle, Home on the Canal, p. 209.

88. Kytle, Home on the Canal, p. 209.

89. This information was based on field examinations of the Conococheague Creek Aqueduct and historic photographs at C&O Canal National Historical Park, Sharpsburg, Maryland.

90. Kytle, Home on the Canal, p. 209.

91. National Park Service Construction Drawing No. (illegible), dated February 1962. On file at Historic American Building Survey and Historic American Engineering Record (HABS/HAER) Offices, Washington, DC.

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